AMERICAN DYNAMICS

Fibre RAID Expansion Unit

User Manual

8200-2606-02

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tyco

User Manual

Fibre RAID Expansion Unit

Version 1.0

Part Number: 8200-2606-02

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Technician Notes

Warning

Only authorized technicians should attempt to repair this equipment. All trouble shooting and repair procedures allow only module replacement. Because of the complexity of the individual boards and sub-assembles, no one should attempt to make repairs at the component level or make modifications to any printed wiring board. Improper repairs can create a safety hazard.

Warning

To reduce the risk of personal injury from electric shock and hazardous energy levels, do not exceed the level of repairs specified in these procedures.

Caution

The system is designed to be electrically grounded. To ensure proper operation, plug the AC power cord into a properly grounded AC outlet only.

Electrostatic Discharge

Electrostatic discharge (ESD) can damage static sensitive devices or micro circuitry. Proper packaging and grounding techniques are required to prevent damage.

- Transport products in static safe containers such as conductive tubes, bags or boxes.
- Keep electrostatic-sensitive parts in their containers until they arrive at a static free work area.
- Use a wrist strap connected to the work surface as well as properly grounded tools and equipment
- Keep the area free of nonconductive materials such as ordinary plastic assembly aids and foam packing.
- Ensure proper grounding before touching a static-sensitive component or assembly.
- Avoid touching pins, leads, or circuitry.
- Always place drives with printed circuit board (PCB) assembly-side down.

Rack Warnings

If you plan to rack mount the Fibre RAID Storage System, please follow the rack manufacturer's safety instructions. Install the enclosure only in a rack that has been properly secured in an area with suitable environmental conditions.

Caution

Have someone assist you during physical installation.

Caution

To properly ventilate the system, you must provide at least 7.6 cm of clearance at the front and back of the server.

Warning

To reduce the risk of personal injury or damage to equipment, always ensure that the rack is adequately stabilized prior to extending a component outside the rack. A rack may become unstable if more than one component is extended. Extend only one at a time.

System Warnings

Warning

To reduce the risk of personal injury from hot surfaces, allow the hot-plug disk modules and other system modules to cool before touching them.

Warning

To reduce the risk of electric shock or damage to the equipment:

- Do not disable the power cord grounding plug. The grounding plug is an important safety feature.
- Ensure the power cord is inserted into a grounded electrical outlet that is easily accessible at all times.
- Unplug the power cord from the power supply module to shut off power to the equipment

Caution

Protect the storage system from power fluctuations and temporary power interruptions with a regulating uninterruptible power supply (UPS). This device protects the hardware from damage caused by power surges and voltage spikes and keeps the system operational during a power failure.

Caution

The storage system must always be operated with all hot plug modules installed or slot covers in place to ensure proper cooling.

Regulatory and Integration Information

Regulatory Compliance Identification Numbers

For the purpose of regulatory compliance certifications and identification, this system is assigned a serial number. This system serial number can be found on the product label, along with the required approval markings and information. When requesting certification information for this product, always refer to this serial number. This serial number should not be confused with the marketing name or model number.

Product Regulatory Compliance

Product Safety Compliance

This system complies with the following safety requirements:

Table i Product Safety Requirements

IEC 60950-1	Safety of Information Technology Equipment
EN 60950-1	Safety of Information Technology Equipment Including Electrical Business Equipment, European Committee for Electro-technical Standardization (CENELEC)
UL 60950-1	Safety of Information Technology Equipment
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices & Appliances
GB4943	Safety of Information Technology Equipment

Worldwide Safety approvals can be supplied upon request. Please contact your sales representative for approvals.

Product EMC Compliance

This product has been tested and verified to comply with the following electromagnetic compatibility (EMC) regulations.

Communications Commission Notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device, as well as additional operating instructions for the user. The rating label on the device shows which class (A or B) the equipment falls into. Class A devices do not have an FCC logo or FCC ID on the label. Class B devices have an FCC logo or FCC ID on the label. Once the class of the device is determined, refer to the following corresponding statement.

Class A Equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Declaration of Conformity for Products Marked with the FCC Logo—United States Only

This device complies with Part 15 of the FCC Rules Operation and is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
For questions regarding your product, please contact your sales representative.
To identify this product, refer to the Part, Series, or Model number found on the product.

European Union Notice

Products with the CE Marking comply with both the EMC Directive (89/336/EEC) and the Low-Voltage Directive (73/23/EEC) issued by the Commission of the European Community. Compliance with these directives implies conformity to the following European Norms (items in brackets are the equivalent international standards):

Table ii European Union Safety Requirements

EN55022 (CISPR 22)	Electromagnetic Interference
EN55024 (IEC61000-4-2,3,4,5,6,8,11)	Electromagnetic Immunity
EN61000-3-2 (IEC61000-3-2)	Power Line Harmonics
EN61000-3-3 (IEC61000-3-3)	Power Line Flicker
EN60950 (IEC950)	Product Safety

Canadian Notice (Avis Canadien)

Class A Equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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Power Cords

The power cord set included in the system meets the requirements for use in the country where the system was purchased. If this system is to be used in another country, contact your sales representative to purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product's electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the cross-sectional area of the wires must be a minimum of 1.00mm² or 18AWG, and the length of the cords must be between 1.8m (6 feet) and 3.6m (12 feet). If you have questions about the type of power cord to use, contact your sales representative.

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Introduction

Audience Assumptions

This manual assumes that you are a service technician or network administrator familiar with computer hardware, data storage and network administration terminology and tasks. It also assumes that you have a basic knowledge of networking and RAID technology concepts.

System Overview

The Fibre RAID Expansion Unit is low cost, high performance 2U/12 bay SAS disk expansion enclosure for use with a Fibre RAID Storage system.

The Fibre RAID Expansion Unit can be populated with 12 hot plug SAS, SATA I/ II or mixed hard disk drives. Up to 3 Fibre RAID Expansion Unit enclosures can be daisy chained to a Fibre RAID Storage system. With the Fibre RAID Storage holding 15 disks and each Fibre RAID Expansion Unit holding 12 disks; a fully loaded configuration can hold a total of 51 disk drives.

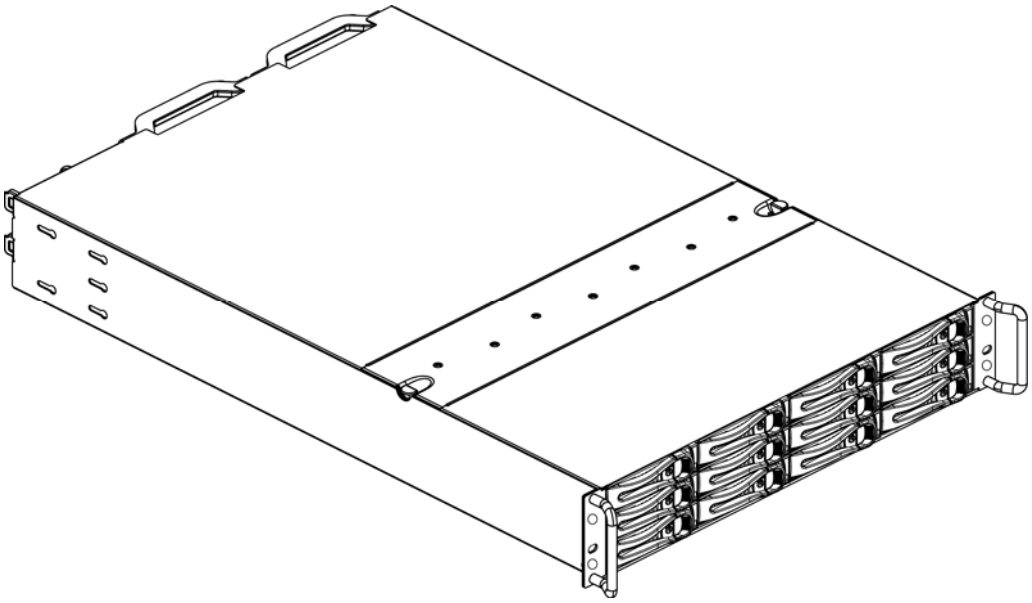


Figure 1 Fibre RAID Expansion Unit (Front View)

Each Fibre RAID Expansion Unit enclosure can be configured with one or two hot plug SAS I/O modules for redundancy. Each I/O module on the Fibre RAID Expansion Unit comes with three 12Gbs SAS connectors for low cost high performance connectivity with the Fibre RAID Storage system and additional Fibre RAID Expansion Units. The enclosure is also equipped with redundant power supplies, fans and a fully passive and serviceable mid-plane.

Table 1 Product Features

Chassis	2U rack-mounted chassis
SAS IO Modules	Support single or dual SAS IO Modules for SAS connection with the Fibre RAID Storage System
Power	Support single 700W power supply module or 1+1 redundant power supply module equipped with universal AC input that includes PFC
Storage	Twelve hot-pluggable 3.5” hard disk bays
Backplane	SATAII and SAS backplane for connecting 12x3.5” Drive modules

Chassis Layout

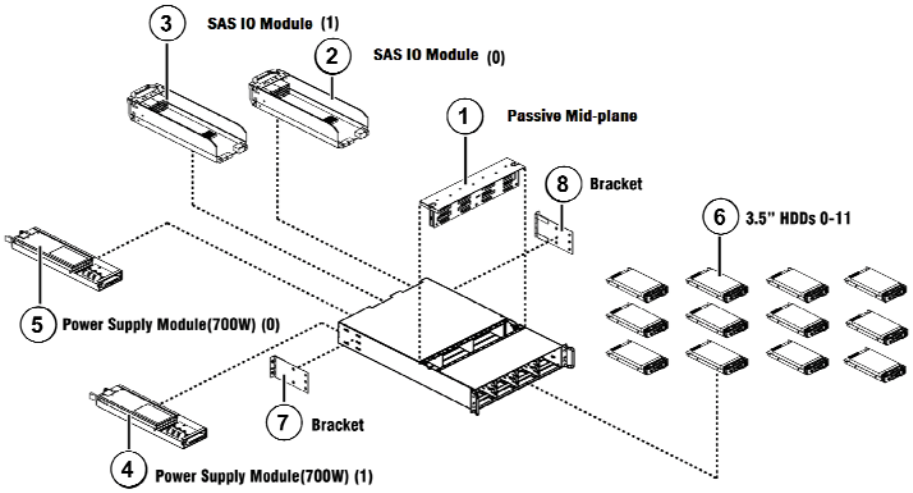


Figure 2 Chassis Layout

① Passive Mid-Plane
② SAS IO Module 0
③ SAS IO Module 1
④ Power Supply Module 1
⑤ Power Supply Module 0
⑥ 3.5” Drives 0-11
⑦ Rack Mount Bracket
⑧ Rack Mount Bracket

Front View

The front of the Fibre RAID Expansion Unit allows easy access to the 12 hot plug drive canisters. Each drive canister has a status LED located to the right of the release handle.

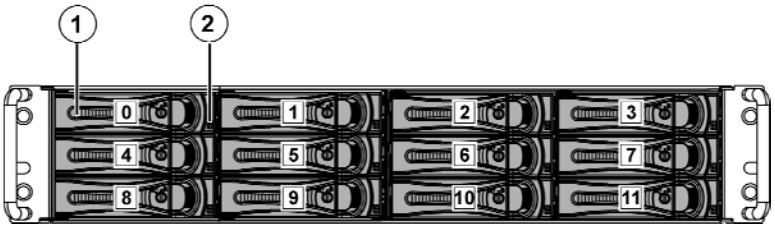


Figure 3 Fibre RAID Expansion Unit Front View

① Drives (0-11)
② Drive Tray LEDs

Note

Hard Disk Drives are numbered 0 through 11 as shown in the figure above.

Rear View

The back of the Fibre RAID Expansion Unit provides easy access to the hot plug SAS IO Modules, fans and power supply modules. All of the device and power connections are externally accessible and are located in the back of the system.

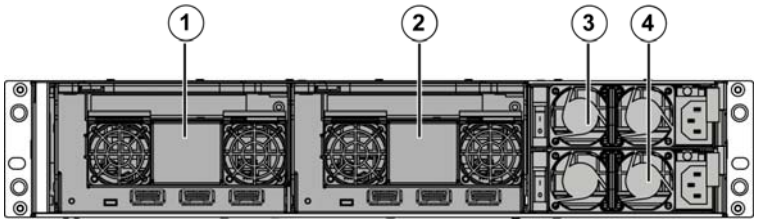


Figure 4 Rear View with Hot-Plug Modules

① SAS IO Module 0
② SAS IO Module 1
③ Power Supply Module 0
④ Power Supply Module 1

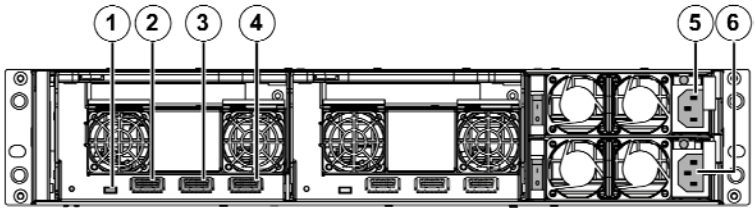
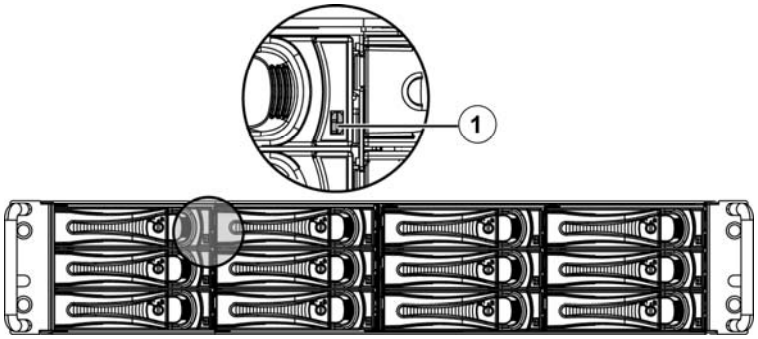


Figure 5 Rear View with Connectors

① Mini-serial Port
② SFF-8470 Connector 0/Table Routing
③ SFF-8470 Connector 1/Table Routing
④ SFF-8470 Connector 2/Subtractive Routing
⑤ AC Power Connector 0
⑥ AC Power Connector 1

System LED Information

This system is equipped with LED indicators for all major components of the system. These LEDs provide visual cues to the status of each of these components.



① Drive Tray LED

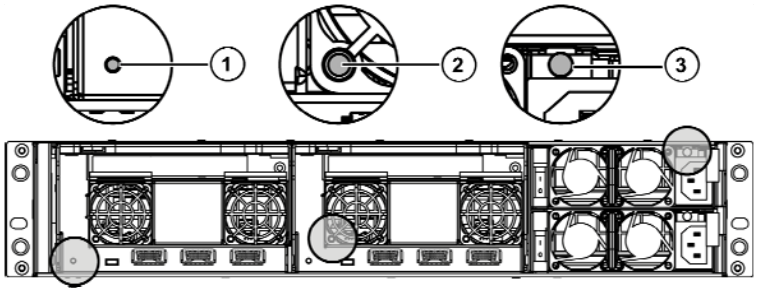


Figure 6 Rear View LED

① System Health LED
② Fan Fail LED
③ AC Power LED

The LEDs in the front of the system provide information on the status of each of the 12 hot plug disk drives. The LEDs located in the back of the system provide information on the status of the fans, AC power and system health. Table 2 LED Information provides details on each LED and the different warnings they provide the user.

Table 2 LED Information

Type of LED	Color	Status
Front View LEDs		
Drive Tray LEDs	Blue	On: Drive present
		Off: Not present
		Blinking: Drive activity or RAID rebuild
	Red	On: Drive fault
Back View LEDs		
System Health LED	Green	Blinking: Operation normal
	Red	On: System failed (voltage or temperature not w/in tolerance)
Fan LEDs	Red	On: Fan(s) within tray failed or not spinning at minimum speed of 3000 RPM.
		Off: Operation normal
AC Power LEDs	Green	On: Output ON and OK
		Blinking: AC present but power supply off
	Amber	On: Power supply critical event causing a shutdown (power supply failure, fuse blown, Fan Failed, etc.)
		Blinking: Power supply has a warning condition but continues to operate (i.e. high temperature, high current, high power, slow fan in the front or internal fan not functioning properly.)
		Off: No AC power to power supply module

Hardware Installation

Before you Begin

Before you setup your Fibre RAID Expansion Unit, thoroughly research and establish an installation and configuration plan for your specific network environment. You should also plan how you want to configure your storage.

Kit Contents

Make sure you have all the components that shipped with your system. The Fibre RAID Expansion Unit ships with the following:

- **Chassis** – One 2U chassis with one or two Controller Modules (CM) installed.
- **Hard Disks** – Twelve Hard Disk Modules (HDM) are shipped with your system. Each HDM consists of a SATA hard drive in a hot plug canister.
- **Power Cords** – Two power cords.
- **Serial Cable** – A serial (RS232) null modem cable for use with the management port on the system.
- **SAS Cable** – Two SAS Cables
- **Chassis Brackets** – Two chassis brackets for rack installation.
- **Quick Start Guide**

Rack Installation

Warning

A stabilizer must be correctly attached to the bottom, front of the rack to prevent the rack from tipping forward while the enclosure is being removed or installed. Do not remove or install any enclosure if a stabilizer is not attached to the rack.

Warning

Do not attempt to lift the enclosure by yourself. Ask another person for aid.

Warning

Do not use the handles from the SAS IO controller or power supply modules to carry the enclosure. These handles are not intended to support the weight of the enclosure.

Note

The Fibre RAID Storage System is designed to be mounted in a quality 30” deep industrial grade computer IT rack with proper cooling. To ensure proper operation and data integrity, an uninterrupted stable AC power source must be provided. An Uninterruptible Power Supply (UPS) is recommended for each Fibre RAID Storage System to allow for proper shut down in the event of a sudden loss of power.

1. Place the bracket on one side of the chassis with the locking tabs aligned with the locking tab holes.

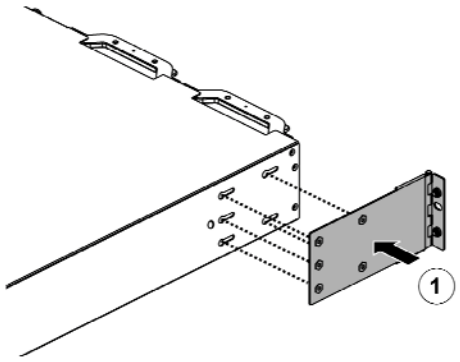


Figure 7 Attaching the Bracket to the Chassis

2. Push the bracket along the direction of the arrow as the figure below shows. Make sure the bracket is locked. Repeat for the other side.

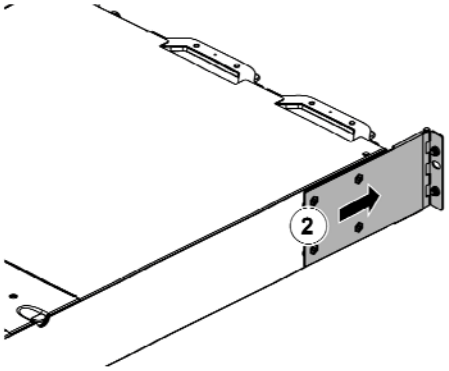


Figure 8 Locking the Chassis Bracket

3. Lift the system to the desired position on the rack with the help of a second person.

4. Rotate the hinge shown below, and make sure that the hole of the bracket is aligned with the rack hole.

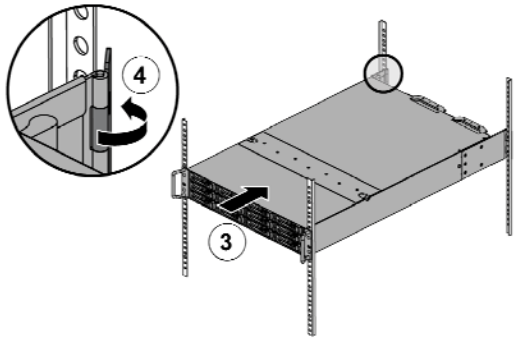


Figure 9 Mounting the Chassis onto the Rack

5. With someone holding the system in place, tighten the 2 front and 2 back screws to fix the chassis to the rack.

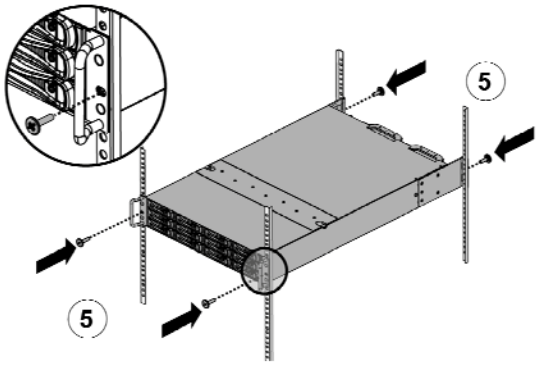


Figure 10 Fixing the Chassis to the Rack

SAS Connections

The system is designed with external SAS connectors to connect with the Fibre RAID Storage system and to other Fibre RAID Expansion enclosures. These SAS connectors can be used for upstream connection (subtractive routing) or downstream cascading (table routing). Upstream and downstream connections are required to be connected to different SAS connectors. Refer to Figure 11 below for further details. Please see illustration below for details.

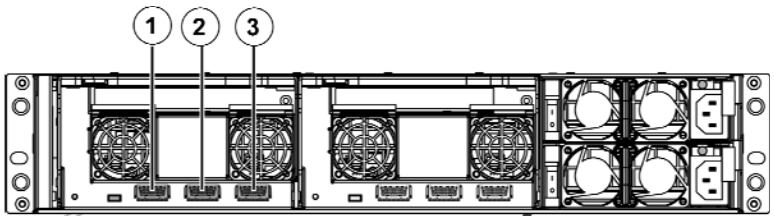


Figure 11 SAS Connectors

① SFF-8470 Connector 0/Table Routing ♦

② SFF-8470 Connector 1/Table Routing ♦

③ SFF-8470 Connector 2/Subtractive Routing ●

Figure 12 Fibre RAID Expansion Unit Connection Diagram shows the supported cabling configuration for Fibre RAID Storage system and up to three Fibre RAID Expansion Unit expansion enclosures.

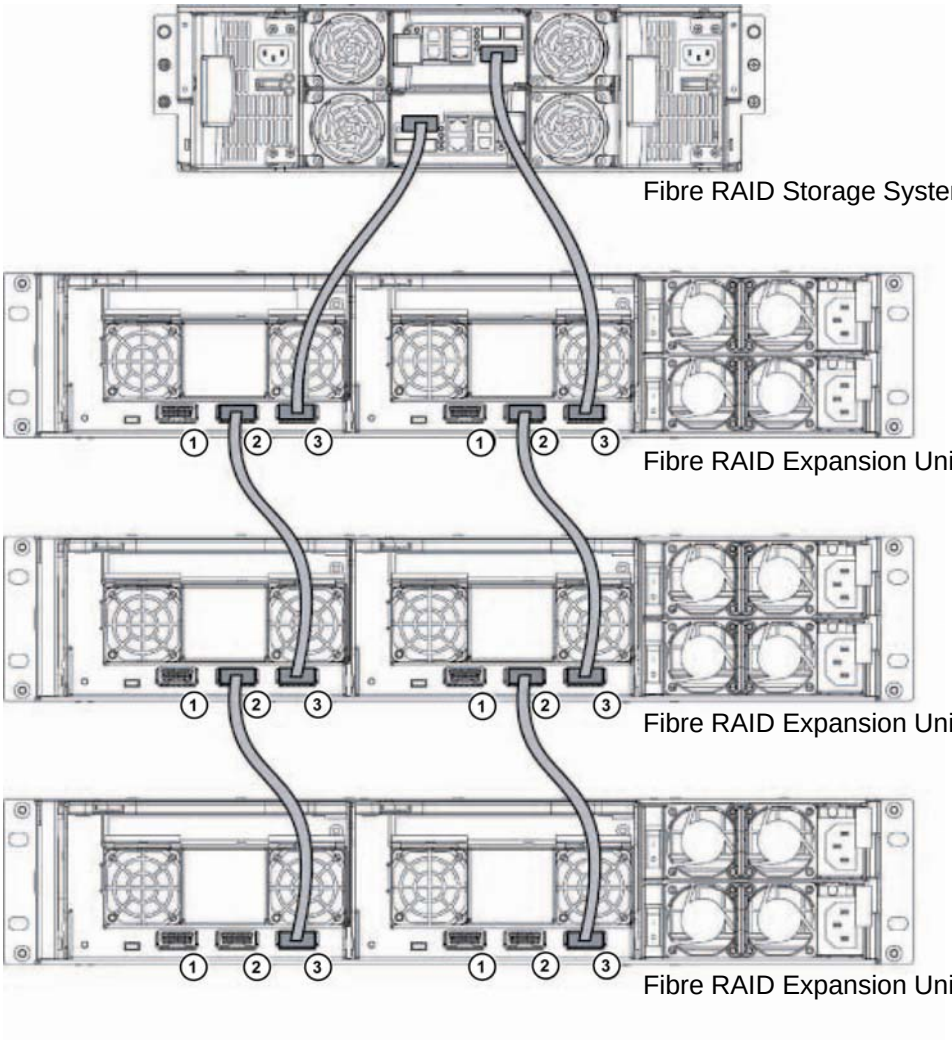


Figure 12 Fibre RAID Expansion Unit Connection Diagram

Use the following steps to properly cable a Fibre RAID Storage System and up to three Fibre RAID Expansion drive enclosures.

Start from the Fibre RAID Storage System and connect to the first Fibre RAID Expansion enclosure. Then add additional Fibre RAID Expansion enclosures.

Each RAID controller on the Fibre RAID Storage System has a single SAS connector marked with a ♦/● icon.

1. Connect one end of one of the included SAS cables to the SAS connector on RAID controller 0 of the NetCOR™ 6000.

   Each IO module on the Fibre RAID Expansion Unit has 3 SAS connectors. Two are marked with ♦ icon (downstream/cascading) and one is marked with a ● icon (upstream).

2. Connect the other end of the SAS cable from Step 1 to the SAS connector marked with an ● icon on SAS IO module 0 of the 1st Fibre RAID Expansion Unit.

3. Follow the same exact process described above to connect RAID controller 1 on the Fibre RAID Storage System to SAS IO module 1 on the 1st Fibre RAID Expansion Unit.

   You have now properly connected the Fibre RAID Storage System to the 1st Fibre RAID Expansion enclosure.

4. If you have additional Fibre RAID Expansion enclosures to add to this RAID system, follow the rest of these steps to daisy chain them to the 1st Fibre RAID Expansion Unit.

5. Connect one end of another of the included SAS cables to the SAS connector marked with an ♦ icon on the SAS IO module 0 of the 1st Fibre RAID Expansion chassis. Connect the other end of the SAS cable to the SAS connector marked with an ● icon on SAS IO module 0 of the 2nd Fibre RAID Expansion enclosure.

6. Follow the same exact instructions above for connecting SAS IO module 1 on the 1st Fibre RAID Expansion enclosure to SAS IO module 1 on the 2nd Fibre RAID Expansion enclosure.

   You have now properly connected a 2nd Fibre RAID Expansion enclosure to the first Fibre RAID Expansion enclosure.

7. Repeat steps 7 and 8 to add a third and final Fibre RAID Expansion enclosure to this RAID array system.

   This now completes the maximum configuration of one Fibre RAID Storage System to three Fibre RAID Expansion enclosures.

This section describes the hardware setup procedures that you must perform when removing or replacing system components. The Fibre RAID Expansion Unit is designed with tool-less modules which allow users to remove or install modules without any tools. The tool less modules are listed below:

- SAS IO Modules
- Power Supply Modules
- Fan Modules
- Mid-plane
- Hard Drives

SAS IO Modules

This Fibre RAID Expansion Unit is designed to operate with up to two SAS IO modules. When the Fibre RAID Expansion Unit is equipped with dual SAS IO modules, the hot-swappable redundant function is enabled. If one SAS IO module fails, you can replace the failed SAS IO module without powering off the Fibre RAID Expansion Unit, because the surviving IO module takes the place of the failed one.

The Fibre RAID Expansion Unit SAS IO modules are designed to be hot pluggable. They fit into one of the two IO module slots of the Fibre RAID Expansion Unit. The Fibre RAID Expansion Unit SAS IO modules contain firmware that initializes and configures various onboard devices and registers on the IO module. Figure 13Figure , SAS IO Module Panel, shows the front panel of a SAS IO module.

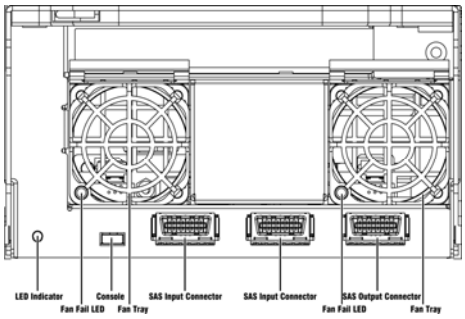


Figure 13 SAS IO Module Panel

Features:

- Three (x4), 12Gbps SAS connectors - the two left SAS connectors are configured with a routing table attribute (♦ downstream connectors). The right SAS connector is configured a subtractive routing attribute (● upstream connector).
- Two hot pluggable fan trays - each consists of two variable speed fans. The SAS IO module automatically controls the fan speed based on temperature.
- One serial console port with a mini stereo connector for serial terminal connection.
- One IO Module LED status indicator.
- Two Fan Fail LED indicators (one on each fan).

The location of the SAS IO module on the Fibre RAID Expansion Unit is shown below:

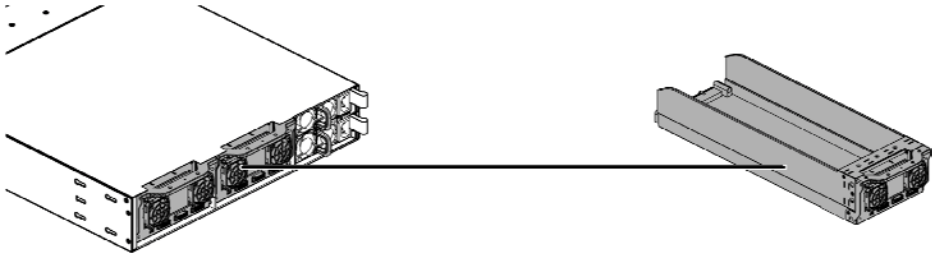


Figure 14 SAS IO Module Location

To remove the SAS IO module:

① Press the locking button.

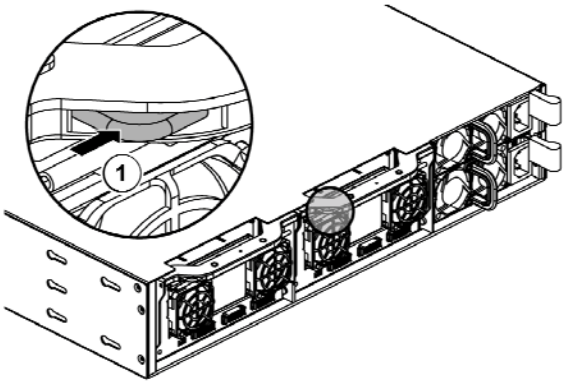


Figure 15 Pressing the Locking Button

② Pull down the locking handle to release the SAS IO module.

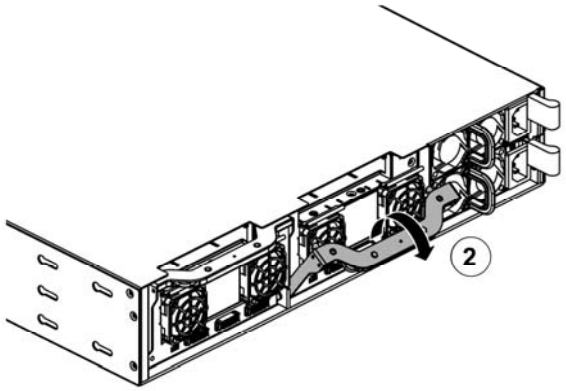


Figure 16 Release the SAS IO Module

③ Pull out the SAS IO module from the chassis using the handle.

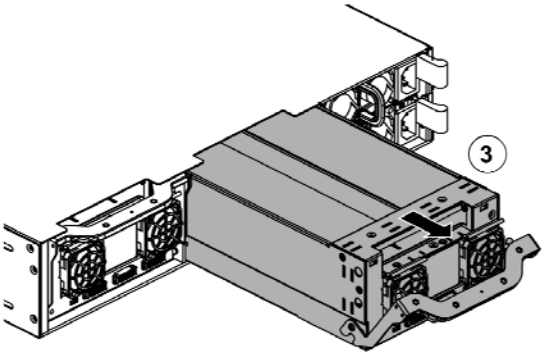


Figure 17 Removing the SAS IO Module

To install the SAS IO module:

① Carefully insert the SAS IO module into the bay with the handle fully extended until it completely enters the IO bay.

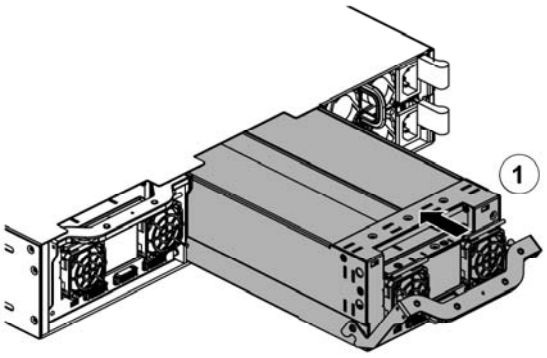


Figure 18 Inserting the SAS IO Module

② Push the locking handle along the direction of the arrow until it locks to secure the SAS IO module.

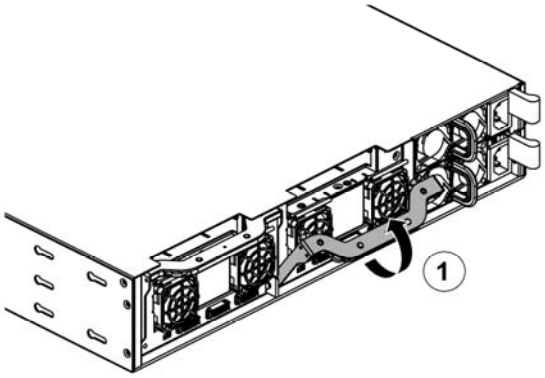


Figure 19 Securing the SAS IO Module

Note

Make sure that the SAS IO module is fully inserted and locks into place. This ensures a proper connection with the backplane.

Power Supply Modules

The Fibre RAID Expansion Unit contains two 700 watt power supply modules to provide redundant power for the entire enclosure. One power supply provides enough power to boot up and run a fully loaded system. The second power supply serves as a backup in the event of a system failure.

Each power supply module contains two non-removable external fans to cool the power supply module. The module shuts itself down if the specified limit is exceeded for temperature or output current.

Features:

- On/off DC power switch
- Two Non-removable variable speed fans
- AC plug receptacle
- Power supply status LED

The location of the power supply modules on the Fibre RAID Expansion Unit is shown below:

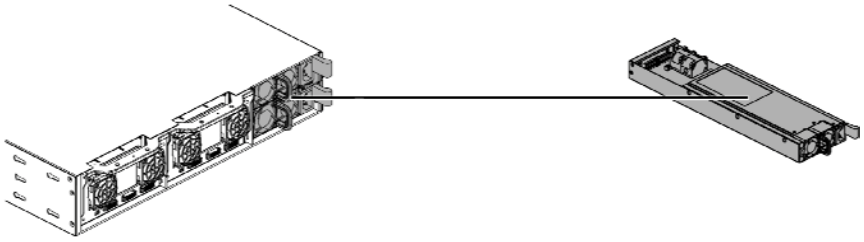


Figure 20 Power Supply Module Location

Note

Before you remove or install the power supply module from the Fibre RAID Expansion Unit, disconnect the power supply cords.

Note

Moving the Power On/Off switch to the Off position does not completely remove power from the system. Some portions of the power supply and some internal circuitry remain active. Disconnect all power cords from the Fibre RAID Expansion Unit to completely remove power from the system.

To power off the power supply:
Press the power switch ① to the off position. The green power LED ② will turn off.

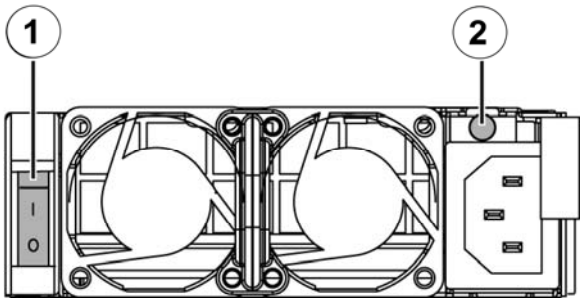


Figure 21 Power Switch and LED

To unplug the power cords:
First unplug the power cords from the AC outlet and then from the Fibre RAID Expansion Unit.

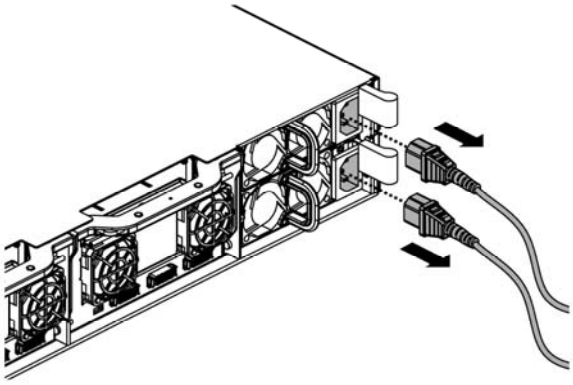


Figure 22 Unplug the Power Cord

Remove the power supply module:

① Press the retaining clip on the right side of the power supply along the direction of the arrow.

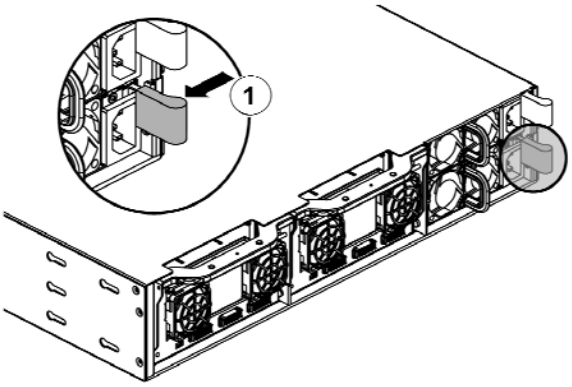


Figure 23 Release the Power Supply Module

② At the same time, pull out the power supply by using its handle. (The power supply will require steady pressure to remove.)

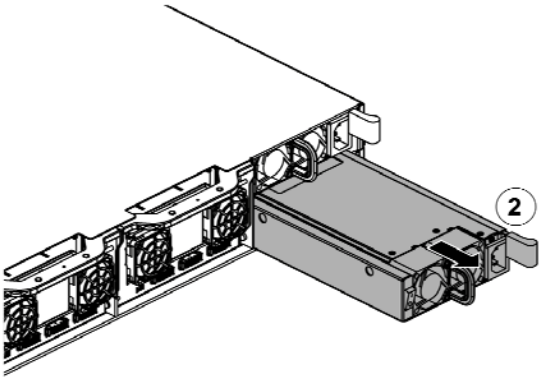


Figure 24 Removing the Power Supply Module

Install the power supply module:
Insert the replacement power supply firmly into the bay. The retaining clip should snap. Connect the AC power to the replacement power supply module.

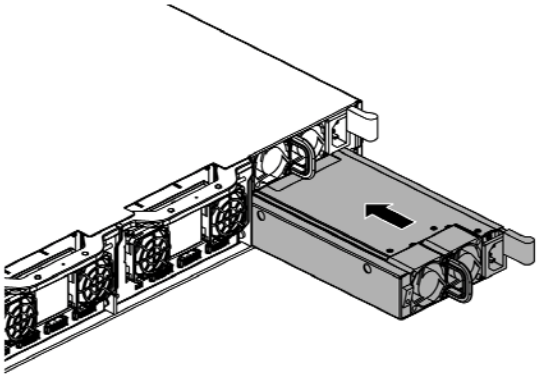


Figure 25 Installing the Power Supply Module

SATA II and SAS Drive Modules

Each Fibre RAID Expansion Unit can be populated with up to 12 hard drive modules. Each module consists of a SATA or SAS disk drive housed in a hot plug canister. There are two types of hot plug canisters, one for SATA that provides dual port functionality and the other for SAS.

The location of drive modules is shown below:

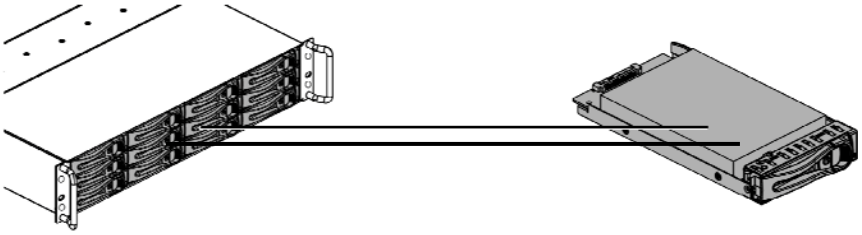


Figure 26 Drive Module Location

The layout of drive canister is shown below:

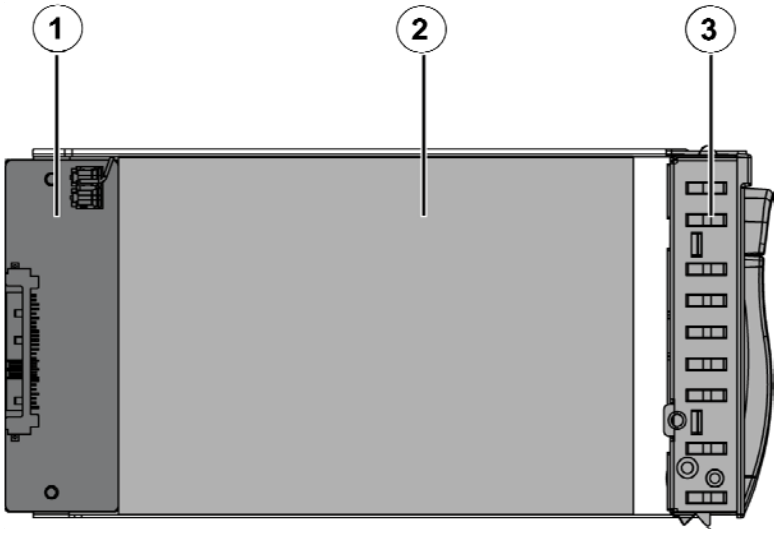


Figure 27 Hard Disk Module

① HDM (Hard Disk Module) Card
② Hard Disk Tray
③ Hot-plug Handle Assembly

Note

A unique SAS or SATA II HDM card is required for each type of drive.

Note

Take note of the Hard Disk Module orientation before sliding it out. The Hard Disk Module will not fit back into the bay if inserted incorrectly.

A drive requires replacement if the drive tray LED is red. To ensure this is not a drive seating issue, pull out the drive and reinsert firmly into the drive bay. If the LED remains red then the drive requires replacement.

To remove the drive module:
① Slide the release button along the direction of the arrow to release the drive module handle. The drive handle will pop out automatically.

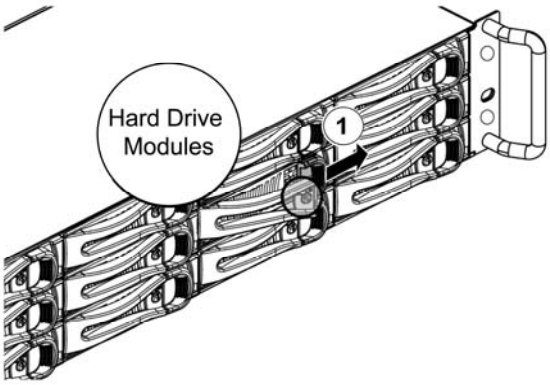


Figure 28 Release the Hard Drive Module

② Slide the drive module out of the drive bay.

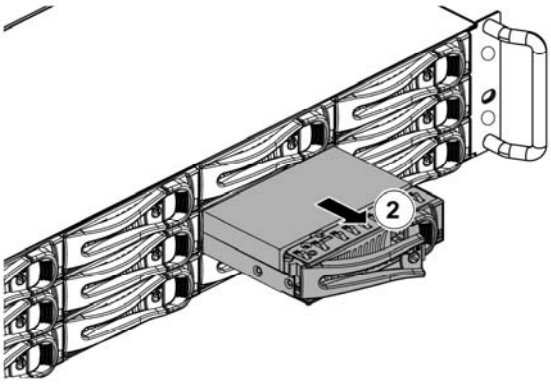


Figure 29 Slide the Hard Drive Module

To install the drive module:

① Carefully insert the drive module completely into the drive bay with the drive module handle open.

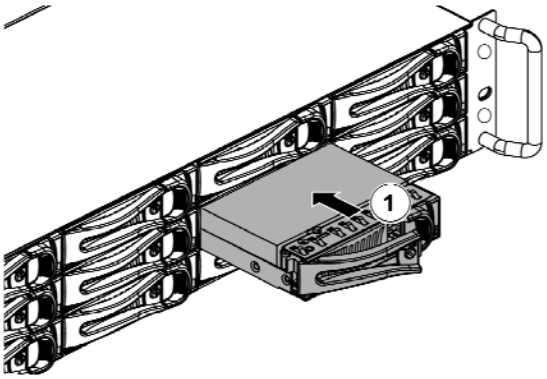


Figure 30 Inserting the Drive Module

② Once completely inserted into the drive bay, push the drive module handle back in place.

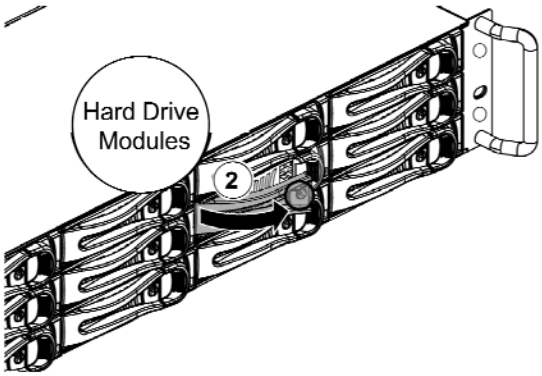


Figure 31 Pushing the Drive Module Handle Back Into Place

Rules for Adding Storage:

The Fibre RAID Expansion Unit functions as an expansion enclosure for the Fibre RAID Storage System. Up to Three Fibre RAID Expansion Unit expansion enclosures can be added to a Fibre RAID Storage System in a daisy chain fashion using the supplied SAS IO cables to enable a maximum capacity of 51 drives. Fibre RAID Expansion Unit enclosures can be added while the system is running (hot-added). To hot-add a Fibre RAID Expansion Unit to an existing system, the Fibre RAID Expansion Unit must be the last enclosure in the daisy chain.

Fibre RAID Expansion Unit enclosures follow the same concept of “disk groups” used for the Fibre RAID Storage System. A “Disk Group” (DG) is composed of an associated group of disks with similar RAID properties. All DGs must be assigned a RAID level. The system supports RAID 0, 1, 5, 10. The following rules must be followed when creating DGs for a Fibre RAID Storage System/Fibre RAID Expansion Unit:

Note

To improve the utilization of the available storage capacity and ensure reliability, it is recommended that all disk drive modules within a DG be the same size and from the

same manufacturer. This is because for each RAID Group, the system scales down to the size of the smallest drive (except for RAID 0).

- A DG can span across interconnected Fibre RAID Storage and Fibre RAID Expansion Unit systems.
- Drives within a DG can reside in any order across any of the enclosures in a system.
- The capacity of a DG can be expanded by adding disks from the available pool of global spare disks. (Adding disks to a disk group may require multiple disks.) DGs can be accessed by either controller, but must be assigned a primary controller.
- Drives not assigned to a disk group will be classified as “Global Spares”.
- Global spare(s) can reside on any of the 4 interconnected chassis to protect any DG within the four chassis. A Global Spare cannot be added to RAID 0 DG.
- Failed Disks or disks disassociated from their disk group will be classified as “Orphans” by the system.
- It is recommended not to build a RAID 5 DG beyond 8 drives. The bigger the RAID 5 DG, the higher the probability for multi-drive failures. Multi-drive failure is not protected by RAID 5.
- To build RAID 5 DG bigger than 8 drives, use the system’s capacity expansion feature to concatenate a second RAID 5 disk group to the first. You can do this multiple times up to a maximum of 24 drives.

Disk Group (DG)	RAID 0	RAID 5	RAID 1	RAID 1 + 0
Minimum Number of Drives	2	3	2	4
Maximum # of Drives per DG Capacity	24	24	24	24
DGs Allowed per System	1-4	1-4	1-4	1-4
RAID Level Allowed per DG	1	1	1	1
Drives Must be Added in	Singles	Singles	Pairs	Pairs
Global Spare Capability	N/A	Yes	Yes	Yes
Access to DG by both Controllers	Yes	Yes	Yes	Yes

Disk Roaming:
The Fibre RAID Expansion Unit has the unique capability of allowing disk groups and their properties to roam with the drives. The user can physically remove the drives that make up a disk group and install in different locations within the same array, or in a different array. The system will recognize the disk group configuration including the RAID volume.

Masking and host information are contained in the controller. You will need to reconfigure the masking and host information if you move the disk group to a new controller, as in moving the disk group to a new chassis.

Disk roaming is possible because when a disk group is created, the system automatically creates a small 128MB partition on each drive. This partition contains the disk group configuration. In this way, all the information regarding a disk group can be recognized by any Fibre RAID Storage controller during the automatic boot up discovery or during a manual discovery using the Fibre RAID Storage System Manager or CLI.

The drives can be reinserted in different slots and they can be rediscovered while the system is on-line. You can take advantage of this flexibility to arrange your storage for different on-line and off-line tasks. This feature provides a basic and inexpensive way to upgrade a system and retain your data or move drives to another system for basic system recovery.

Note

All drives in a DG needed for automatic boot up and discovery need to be present for the disk group discovery to take place. A disk group with one missing member can be forced online using the NetCOR™ Storage Manager or CLI discovery command.

Disk Orphans

If some of the drives from a disk group are not re-inserted or a drive from the disk group goes bad and is not reconstructed before it roams to a new system, the system will not be able to discover the disk group. It will know that one or more drives are missing and will designate the drives in the incomplete disk group as orphans. The data in the incomplete set is maintained, however user intervention is required to reset the drives. This ensures that the data on the remaining drives is not overwritten. If the drives are designated as orphans, the user has the following options:

- **Complete the Set** You can track down the remaining drives from the disk group, insert them in any order into the same Fibre RAID Storage/Fibre RAID Expansion enclosure and use the Fibre RAID Storage Manager to do a discovery. Once the whole set is discovered, the disk group will be restored.

- **Rebuild a Disk Group** If the original group is part of a RAID 5, 1 or 10 disk group, a bad drive maybe the reason for an orphan classification by the system. If this is the case, make sure you have a global spare in the system and then use the Fibre RAID Storage Manager to do forced discovery of the disk group. Once the disk group is discovered and the bad drive is identified, the system will start the RAID rebuild using the global spare. This will restore the Disk Group.

- **Re-configure the Drives** If you cannot complete the disk group or rebuild it, then you will not be able to recreate the disk group (it is recommended you always back up your data to recover from such a scenario). Alternatively you may just want to reuse drives from an old disk group where the data on the drives is no longer needed. In either case you can create a new disk group or turn the drives into global spares by using the Fibre RAID Storage Manager.

Failure Conditions:

- **RAID Controller Failure** When a RAID controller fails in the Fibre RAID Storage System with redundant controllers, all drives including those on interconnected Fibre RAID Expansion Unit enclosures will fail-over to the surviving controller.

- **Drive Failure** If a drive fails in a RAID 1, 5 or 10 DG, the DG will go into degraded mode. If a global spare is present in the system, the spare will be automatically added to the DG and a rebuild of the DG will be initiated. (Note: RAID 0 by definition has no protection and therefore cannot be rebuilt.)

- **SAS IO Failure** When a SAS IO module in one of the interconnected Fibre RAID Expansion units fail, the system will treat all drives associated with that IO module as failed. If only one drive is missing from the associated DGs the system will rebuild it using an available global spare. If more than one drive is associated with the affected DGs, all writes to the DG will be suspended and the DG will be made available to the system in read-only state. Once the IO module is replaced, the user can use the system utilities to rebuild/repair the affected disk groups.

- **SAS Cable Disconnect** If a cable fails or is removed, the system will react as if the SAS IO Module failed. (See the SAS IO Failure section above.)

Mid-Plane

The mid-plane consists of the drive backplane and SAS IO backplane joined together by a mid-plane bracket. The drive backplane can support twelve 3.5” SATA II and SAS drives. The design incorporates a hot-swappable feature to allow easy replacement of drives. The system uses a SAS IO backplane to connect the drive backplane with the SAS IO modules and power supply modules.

The location of the mid-plane module on the Fibre RAID Expansion Unit is shown below:

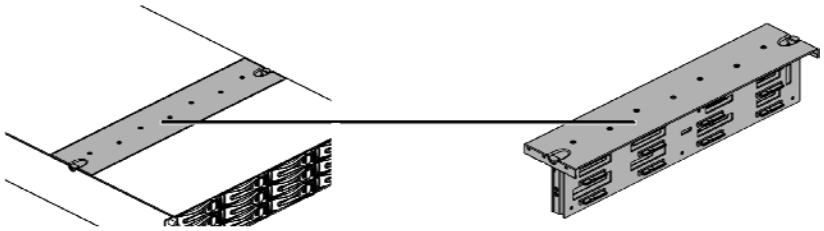


Figure 32 Mid-Plane Location

Before you remove or install the mid-plane, please follow the steps below:

1. Make sure the Fibre RAID Expansion Unit is not turned on or connected to the AC power.
2. Remove the SAS IO module(s).
3. Remove the power supply module(s).
4. Remove all the drive modules.

To remove the mid-plane module:

① Push in the locking buttons on both sides of the mid-plane

② Lift up the mid-plane.

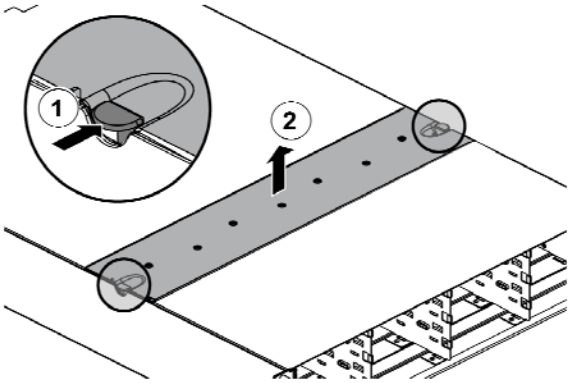


Figure 33 Removing the Mid-Plane

To install the mid-plane:

Insert the mid-plane into the chassis. Ensure the mid-plane is fully inserted and the buttons on both sides of the mid-plane lock into place.

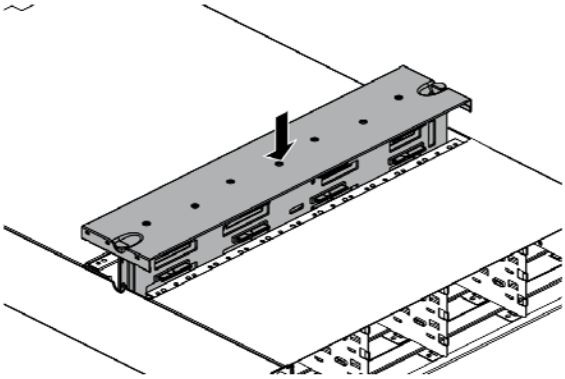


Figure 34 Installing the Mid-Plane

Appendix A System Specifications

System Enclosure Dimensions

Height	Width	Depth
87.5mm (3.44in.)	446mm without ears (17.56in.)	687mm (27.05in.)

Weight

Maximum Weight (12x Drives)
28.96kg ±5% (63.85 lbs.)

The weight of a Fibre RAID Expansion Unit depends on its configuration.

Environment

	Temperature	Relative Humidity
Operating	10°C to 35°C (50°F to 95°F)	20% to 80% non-condensing
Non-operating	-40°C to70°C (-40°F to 158°F)	10% to 95% non-condensing

Power

Power	100-120/200-240Vac input, 50/60Hz
Current	8/4A

Please visit our website for more information
www.americandynamics.net

Part Number: 8200-2606-02